FACTS ABOUT THE RECLAMATION AND RECYCLING OF GLASS CONTAINERS

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GLASS CONTAINER INDUSTRY POLICY

concerning

SOLID WASTE MANAGEMENT

and

LITTER PREVENTION

Glass bottles and jars have been widely used by civilized peoples for 35 centuries. They were first used as containers by the ancient Egyptians. Today — 3,500 years later — they are the most commonly used of all rigid containers to package foods, beverages, drugs, chemicals, toiletries and various other essential consumer goods.

The glass container manufacturing industry — with eleven production plants in five provinces — today employs 7,700 men and women. Its annual payroll exceeds $53 million.

The glass container industry recognizes that its products, because they are a dominant factor in present-day consumer goods packaging, become a part of litter and solid waste. (They account for about 5 per cent by weight of solid waste and about 3 per cent by item count of litter.)

The industry further recognizes that litter and solid waste present major problems adversely affecting the quality of the environment.

The industry, in the light of these facts, readily accepts a responsibility for helping to resolve these urgent environmental problems.

Solid Waste Management

The glass container industry is committed to the proposition that the most effective long-range solution to the solid waste problem lies in the salvage and recycling of the many components of refuse through design and application of modern techno-

logical systems. The industry holds the conviction that this solution is most commensurate with:

1. Conservation of natural resources
2. The preservation of environmental quality
3. Improved efficiency of solid waste management.

The glass container industry is further committed to the proposition that this long-range objective can best be obtained through cooperation between government, industry and the public.

The role of government must be:

1. Federal government — basic research to develop broad technological capabilities, funding of demonstration projects, dissemination of information on technological progress and market opportunities, and provision of incentives for community and regional waste management systems.
2. Provincial government — Fostering development of local, regional and provincial solid waste management systems and standards, and coordination between provincial, federal and community programs.
3. Local government — establishment and operation of improved refuse collection systems and processing centers and the provision of the community's share of funds for establishment and operation of such systems and centers.

The role of industry must be:

1. Cooperation with government in the development of technology to establish improved waste collection and processing systems, such cooperation to be closely oriented to industry's intimate knowledge of the characteristics and behavior of its products in the solid waste management cycle.
2. The development of markets of sufficient magnitude to absorb the various products salvaged from solid waste.
3. Cooperation with government at all levels in

creating through appropriate communications techniques public and official opinion conducive to the establishment of modern salvage-recycle systems.

The role of the public must be:

1. A factual understanding of the problems involved.
2. Readiness to support programs seeking improved solid waste management systems.
3. Willingness to direct the appropriation of funds for such systems.

The glass container industry as a matter of basic policy is dedicated to pursuing a seven-point program within the framework of responsibilities outlined above:

1. Cooperation with other industries, individual companies and government in the development of innovative waste collection, separation and processing systems designed to close the use-salvage-recycle loop.
2. The conduct and support of research that will contribute to the efficient processing of glass containers in solid waste management systems and their recycling back into production of new containers and such secondary products as glasphalt, building bricks, glass wool and aerated concrete.
3. Development of technology making possible recycling the maximum volume of used container glass back into the bottle making process.
4. Development independently and in cooperation with other industries and government of secondary products using waste container glass.
5. Operation, as an interim measure, of bottle reclamation and recycling programs at glass container production locations throughout Canada. Glass container manufacturers purchase all used non-refillable soft drink bottles that are brought to such reclamation centers by individuals and non-profit organizations, and are prepared to consider purchasing all used bottles and jars.

The average payment for redeemed glass is one cent a pound or $15 per ton. Bottles must be sorted by colour, be reasonably clean and free of metal contamination. The objectives of this interim program are:

a. To demonstrate the recyclability of glass containers;
b. To produce a meaningful volume of used container glass for development of recycling techniques for the manufacture of new glass containers and secondary products;
c. To demonstrate to the public and government that the glass container industry recognizes the urgency of the solid waste problem and is taking immediate steps toward solutions;
d. To provide individuals and community groups in areas proximate to glass container plants the means of participating in the reclamation and recycling effort.

6. Encouragement and support of legislation at the federal, provincial or local levels that will advance attainment of these objectives in the solid waste management field.
7. Unequivocal opposition to any solid waste or litter oriented legislation that discriminates in any way against any individual segment of solid waste or litter.

Litter Prevention

The glass container industry as the result of many years of involvement in litter prevention activities is firmly dedicated to the concept that effective litter control can be attained only through a three-point program of:

1. Public education
2. Enactment and enforcement of adequate anti-littering laws.
3. Provision of adequate devices for collection and disposal of litter — machines for picking up litter, trash receptacles, litterbags and the like.

The industry is equally firm in its conviction that

littering cannot be controlled through legislation that outlaws, discriminately taxes or otherwise restricts the use of specific containers or other products that may appear as part of litter.

The industry is further convinced, as in the case of solid waste management, that meaningful solutions to the litter problem lie in cooperation between government and industry and the public.

Government's responsibilities include:

1. Enactment and enforcement of adequate anti-littering laws.
2. Provision for and servicing of sufficient litter receptacles along streets and highways, on beaches, in parks and other public places.
3. Removal of litter from streets, highways and other public property.
4. Implementation, in cooperation with industry and civic groups, of educational programs designed to dissuade people from littering.

The responsibilities of industry include:

1. The sponsorship of its own, and in cooperation with civic groups and government, educational programs to stop littering by the public.
2. Cooperation with and encouragement of litter prevention organizations at the national, provincial and local levels.
3. Encouragement of provincial and local government in their efforts to enact and enforce anti-littering laws.

The responsibility of the public is:

1. To refrain from littering.
2. To cooperate with and encourage government and industry in the broad spectrum of litter prevention activities.

The glass container industry is committed to implement these basic policies in the litter prevention field through the following activities:

1. Support of Keep Canada Beautiful, through money and service contributions;
2. Support of provincial and local litter prevention organizations;
3. Promotion of the industry's bottle reclamation program as a means of reducing the volume of glass in litter and to serve as an educational device to discourage people from littering in the first place;
4. Continuing implementation of the Glass Container Council Litter Prevention Program in which Council members engage in a variety of litter prevention and clean-up projects in their plant communities;
5. Continuation of dialogue and communications with government and the public to create better understanding of how the litter problem can best be resolved and of what the glass container industry is doing to this end.
6. Support of strong anti-littering legislation at the provincial and local levels.
7. The conduct or sponsorship of research that will contribute to development of more effective litter control or removal techniques.
8. Cooperation with government, litter prevention organizations and other industry groups in the development and execution of programs that seek to solve the litter problem through the principles of the "three E's" — education, enforcement, equipment.

DEFINING THE PROBLEM

— There is a tendency on the part of many people today to confuse the pollution issue by failing to distinguish between litter control and solid waste disposal.

— Litter is a people problem pure and simple. Solid waste management is a material problem, entirely separate and apart from litter.

— Litter is not an industrially caused problem, yet industry can join government at local, provincial and federal levels in the task of education required to reduce littering.

— We are not going to solve the solid waste problem by expecting millions of human beings to sort out garbage in their homes so that the various components of solid waste may be collected individually.

— Neither are we going to solve it long term by expecting those same millions of people to bring such sorted waste materials to appropriate collection or redemption centers.

— Solid waste disposal can be handled best at the community level by municipal services. The municipal garbage collection site must provide the capability to sort, either before or after reduction processes, such as incineration, so that those materials judged to be recyclable may be properly segregated. Glass, steel, aluminum and paper are all materials which can be recycled. Industry is prepared to do that recycling.

GLASS AND THE ENVIRONMENT

— Glass is made of highly abundant raw materials, silica sand, limestone and soda ash.

— Sand accounts for 73 per cent of the materials in container glass. Thus, glass manufacturing is not a serious drain on our natural resources.

— Glass is inert — it does not leach, rust, rot, mould, putrefy, cause disease or give off noxious gases, nor pollute in any way.

— If properly crushed in disposal processes, the glass fragments return to the soil in virtually their original state.
— Glass, as a material, is not a problem in present waste disposal systems. This fact has been confirmed by a survey of 5,000 public works officials recently completed by the Resources Management Corporation in the U.S.A. A similar survey just completed of 21 major cities in Canada confirms that glass poses no particular problems in present solid waste diposal systems.
— Preliminary findings in studies being conducted by the Drexel Institute of Technology, sponsored by the Glass Container Manufacturers Institute, on the performance of glass containers in sanitary landfill indicate that if glass is properly crushed, its volume is reduced to a minimum and there is no significant leaching.
— Glass contributes to a firm landfill and does not contribute to water pollution.
— Glass containers readily break up in the incineration process to help aerate the furnace charge, thus contributing to efficient combustion.
— As glass is inert, it cannot contribute to air pollution in the incineration process.
— In composting, crushed glass provides a valuable soil conditioner.
— Of all manufactured products, glass is the most easily recyclable.

GLASS CONTAINERS AND THE SOFT DRINK INDUSTRY

In 1969 usage of containers in the soft drink industry was as follows:

	U.S.	Canada
Refillable bottles	51%	68%
Cans	30%	20%
Non-refillable bottles	19%	12%

— Non-refillable bottles are made of exactly the same kind of glass as refillable bottles. There is no plastic in non-refillable bottles — so they can be

crushed and reused in making new containers and other products as easily as refillable bottles.
— There are more than 10,000 food and drink items for sale in our supermarkets. Soft drinks are the only products which give the consumer a choice of refillable or non-refillable container.
— Over the past ten years, the average growth of total glass container shipments has been only five per cent per year. This is about equal to that of the overall packaging industry. So it cannot be said that glass containers are making, or will make, a disproportionate contribution to litter or solid waste.
— Non-refillable soft drink containers account for less than one per cent of litter and a negligible percentage of solid waste.
— Bottlers turned to non-refillable bottles because the consumer wants them and here's how the bottler knows the consumer wants convenience. In 1960 all soft drinks bottled in Canada were in refillable bottles and at that time the bottler got an average of 20 trips — 20 refills — out of each bottle. But throughout the '60's trippage dropped in some cases from 20 to 10 and in extreme cases to five or less.
— What happened? It seems that many consumers were using the more expensive returnable bottles as if they were one-way containers.
— Because some consumers stopped returning refillable bottles and trippage plummeted, many bottlers were forced by economic necessity to convert their equipment to handle non-refillable containers.
— The economics of the returnable system were based on the co-operation of manufacturer, retailer and consumer. As long as the consumer and retailer co-operated, the returnable system functioned well. Without this co-operation its continued existence was jeopardized.
— The cure seemed simple — increase the deposit. Many bottlers did just that. Deposits of two cents were raised to three or five cents, and deposits of five cents were raised to seven or ten cents. Bottlers expected more bottles back — but didn't get them.

— For example, about two years ago, the Pepsi Cola Company issued a new float of 14,400,000 16-ounce soft drink bottles in Metropolitan New York. And in order to protect their investment, they raised the deposit from two cents to five cents. And what happened? Within six months the whole 14,400,000 bottles had disappeared from circulation and consumers had forfeited $720,000 in deposits, in a city noted for its large ratio of disadvantaged citizens.
— Can you blame bottlers for concluding that the consumer wants convenience packaging? One bottler said, "We just can't afford to keep investing in the more expensive returnable bottles and have our customers treat them as one-way containers."

SOLID WASTE

— Literally hundreds of companies are presently developing and producing new equipment to collect, compact, crush, sort, separate, compost and burn waste in an effort to get at the raw materials so that they can be reused or turned into new products.
— These developments are spawning a whole new industry which could conceivably provide tens of thousands of jobs and do business measured in billions of dollars. Investment dealers and brokers are well aware of the economic potential of such companies and are keeping a close watch on them.

Why do We have a Solid Waste Problem?

— Because while manufacturing, distribution and marketing techniques have advanced at a tremendous pace in this century, solid waste collection and disposal systems have changed little since the turn of the century except for the replacement of horse-drawn carts by trucks. The growth in wealth and population of North America in this century has simply compounded the problem.

What is the Answer?

— It cannot be a simple ban on products which now show up in solid waste or we would have to

ban everything man produces, consumes or uses. To ban one or two products would be patent discrimination, while leaving others, many of them worse offenders, free to pollute land, water and air.

— The answer must be in research and development of an overall system designed not to dispose of solid waste, but to separate it into its components and recycle or reuse these materials in making either identical or new products.

— Dr. Lee H. DuBridge, U.S. presidential science advisor says: "I strongly reject the idea that we have to destroy our technological civilization, deflate and decrease our standard of living, to improve the quality of life. There may be a few who would like to return to the days of the caveman, but most of us believe that we live healthier, more pleasant lives than they did 10,000 years ago or even 100 years ago."

DIMENSIONS OF THE SOLID WASTE PROBLEM

— Everything man produces or consumes is useful for a relatively brief period of time and when its usefulness is at an end it must be disposed of .

— It has been estimated that each citizen of the United States accounts for approximately 1800 lbs of residential and commercial solid waste per year.

— The figure for Canada during the same year (1968) was only 1,000 lbs or 55 per cent of the U.S. per capita total. This distinction is important since using U.S. figures would lead to an exaggerated overstatement of the problem as far as Canada is concerned. (Per capita figures for solid waste were outlined in a 12-country study prepared for Keep America Beautiful in 1968. Some other countries: Netherlands — 800 lbs; England — 500 lbs; India — 200 lbs).

— In many instances we must use U.S. figures because comparable Canadian statistics are not available, but we must be aware of the differences in using them.

— The following statistics were gathered from a variety of official and semi-official U.S. sources, but

all agree on the general percentages. These figures are for 1967, the latest available:

Total Annual Solid Waste (U.S.A. — 1967)

212,000,000	tons domestic and commercial waste
110,000,000	tons industrial waste
6,500,000	tons construction and demolition remains
1,500,000,000	tons animal wastes
1,100,000,000	tons mining wastes

— In 1968 residents of the United States disposed of:

7,600,000	TV sets
7,000,000	cars and trucks (15,000,000 tons)
100,000,000	rubber tires (1,000,000 tons)
50,000,000,000	cans
26,000,000,000	bottles and jars (6,000,000 tons)
4,000,000	tons of plastics
30,000,000	tons of paper

COMPOSITION OF SOLID WASTE

— An authoritative study reported in the April 1968 proceedings of the American Society of Civil Engineers revealed the following average composition of municipal solid waste in the United States:

Material	Percentage by Weight
Paper	59.0%
Wood, lawn and garden wastes	10.0%
Food wastes	9.0%
Metal	7.5%
Clothes, rags, plastic rubber, leather, dirt	6.0%
Glass	5.0%
Ceramics and ash	3.5%

— The composition of solid waste varies slightly from city to city, but the percentage of various materials remains fairly constant. Here are tabulations for a few typical Canadian cities:

Calgary, Alberta (296,000 tons per year)*

Material	Percentage by Weight
Paper	46.5%
Cardboard	26.5%
Miscellaneous (clothing, footware, furniture and appliances, etc.)	14.2%
Kitchen waste	6.5%
Glass	3.4%**
Metal	1.5%
Magazines	1.2%
Plastics	0.1%
Rags	0.1%

St. Catharines, Ontario (91,250 tons per year)*

Material	Percentage by Weight
Paper products	60%
Food wastes	20%
Liquids	5%
Metals	5%
Plastics	5%
Glass	5%**

Kitchener, Ontario (500,000 tons per year)*

Material	Percentage by Weight
Paper	48%
Food wastes	16%
Miscellaneous	13%
Yard trimmings	9%
Metals	8%
Glass	6%**

*These figures can refer to refuse actually collected by the municipality itself, or to total handled for ultimate disposal which would include commercial as well as residential wastes.

**Typical figures for other municipalities are: Metro Toronto 7.4% (1966-68); Montreal 5.7% (1967); Oshawa, Ontario 6.0% (1970). All figures for glass include container glass, window and flat glass and ceramics (dishes and tableware). Discounting the quantity of flat and plate glass and ceramics, con-

tainer glass represents well under 5% of total refuse in nearly all cases.

The above tabulations are for domestic and commercial waste only, and do not include industrial, mining or agricultural wastes in which there would be little glass.

Packaging materials of all kinds generally account for an average of 14 per cent of solid waste.

SOLID WASTE MANAGEMENT

The Glass Container Council of Canada has followed and participated in a number of research and development programs aimed at finding solutions to the solid waste problem. We have reached the conclusion that solutions are available now.

— The technical equipment necessary to sort raw garbage is available, now.

— Many materials, such as, glass, paper, aluminum and other metals can be recycled NOW — the technology is available. What is lacking is an assured supply of raw materials in the form of waste glass, paper and metals. Once the supply is established, markets can readily be developed — paper back to the mill, aluminum back to the smelter, and glass back to the glass plants.

— The raw material supplies are presently available in domestic and commercial wastes.

— The immediate need is for a central body to which industry, government and interested individuals can contribute funds so that these systems can be put together and tested immediately.

— "The glass industry, by its support of the work of the Glass Container Council of Canada and the Glass Container Manufacturers Institute, has probably made more significant progress in the recycling and reuse of its own products than any other comparable industry." (Dr. R.H. Clark and Dr. J.H. Brown, in a study entitled "Municipal Solid Waste: Problem or Opportunity," prepared for the Ontario Economic Council, October, 1970).

— The solution, we believe, lies in three easily definable areas:

1) Waste collection which is material handling
2) Waste sorting and separation — which is technical and mechanical
3) Reprocessing and recycling — which is manufacturing and no problem if the first two can be solved.

— In short, a large part of refuse represents resources out of place. We can and we must recover these resources as quickly as possible.

THE KINGSTON PROJECT

— To this end, the Glass Container Council of Canada has announced financial and technical support for Canada's first total reclamation plant in Kingston, Ontario, to convert waste to wealth.

— The one million dollar reclamation plant will serve as a prototype unit in Canada as a first step in determining and developing the potential value of municipal wastes such as glass, paper, ferrous and non-ferrous metals, food waste and compost.

— Acting Mayor Kenneth A. Keyes welcomed the new venture. "The City of Kingston is pleased to be a partner in this engineering study regarding a more efficient handling of municipal solid wastes. This city has long been aware of the increasing problem of adequate disposal of municipal wastes and has already commissioned a study regarding an alternative to sanitary landfill. We are delighted to make available information necessary for a practical evaluation of recycling and reclamation as a solution to the problem of municipal waste disposal."

— Engineering design work will be supervised by two Queen's University professors, Drs. R.H. Clark and J.H. Brown, authors of a comprehensive report on municipal waste disposal for the Ontario Economic Council.

— The design-engineering phase will cost $15,000 and will be carried out by two Ottawa-based engineering firms, J.D. Paterson and Associates Limited who

will handle the site evaluation and J.L. Richards and Associates Limited, specialists in construction engineering and project planning for municipal sewage and waste treatment plants. Financing for the one million dollar capital cost of the plant would be secured from private industry and probably from both the provincial and federal governments.

— "We see the Kingston plant not only as a viable operating unit in the reclamation field, but as an ongoing research and development centre in the field of municipal waste disposal," commented H.E. Dalton, Executive Director of the Glass Container Council of Canada. The Kingston plant, he said, could be in operation as early as 1972.

— Mr. Dalton stated Kingston was selected for the site of the prototype reclamation plant for the following reasons:

— Kingston is a city of about 57,000 and in recent years has operated a sanitary landfill system to dispose of about 55,000 tons of solid waste annually. This appears to be an attractive size for a prototype plant.

— The city is currently funding a detailed study of a pulverization and landfill system which will require a capital investment of at least $250,000. However, even this system may present local problems because it still represents a sanitary landfill system.

— There is a significant potential in the area for use of non-degradable materials from a reclamation plant as clean fill.

— The staff and students of Queen's University could provide useful research and consulting support for a new plant.

— The Ontario government's Waste Management Branch has established a regional office in Kingston in addition to regional offices and facilities of the Ontario Water Resources Commission.

— A wide range of federal and provincial laboratories and academic facilities are convenient to Kingston for reference not only in the initial investi-

gation of reclamation but for future efforts in associated aspects of disposal systems.

— The city of Kingston is conveniently close to outlets for reclaimed paper, glass and metals and the land in the surrounding area could gain materially from applications of compost.

— Kingston is surrounded by other communities that could find it attractive to deliver their wastes to a Kingston plant for treatment. Thus the potential for a large scale plant and for regional service exists.

— The reclamation system in the Kingston plant will not employ processes or operations requiring prior physical research; the system will use only technology proven either in disposal operations or in reasonably related fields such as bulk material handling. The main feature of the Kingston system will be in the combination of processes involved. A similar system is operating in Houston, Texas and the vital elements of the proposed process have been proven effective in several other locations.

— For example, the treatment of non-recoverable biodegradable materials such as food waste would use a well-proven composting system which produces a genuinely sanitary product. This system has proven to be highly flexible and reliable in practice.

— Mr. Dalton said every attempt will be made to provide room to expand the prototype plant and to gain the cost reductions associated with a larger scale operation and the refining of reclaimed products.

BLACK-CLAWSON DEMONSTRATION PLANT

— A $2 million solid waste demonstration plant that not only disposes of garbage without pollution, but will also handle liquid industrial residues, reclaim paper fiber, metals and glass, will be in operation in May 1971 at Franklin, Ohio. The plant, being built by the Black-Clawson Co. will handle all solid waste generated throughout the Miami Valley, including Franklin and neighbouring communities.

— The city of Franklin received two-thirds of the

total plant cost under a U.S. Federal Demonstration grant plan.

— The Glass Container Manufacturers Institute is making a major contribution to the cost and installation of electronic equipment which will sort glass fragments by colour. The same equipment will also sort aluminum and copper products from the residue.

— The electronic glass sorting equipment is the result of research sponsored by the Glass Container Manufacturers Institute at the Stanford Research Institute and at the Sortex Company.

— Franklin city manager Bernard Eichholz estimates that from each ton of garbage, 400 pounds of paper can be reclaimed, 120 pounds of metals, and 75 pounds of glass. The remaining 1,400 pounds are burned, with only 5 per cent remaining as ash which will be used as a settling material in a $2.4 million liquid sewage treatment plant being built next to the solid wastes facility.

— In other systems, the remainder of the refuse, once the reclamable, recyclable and saleable materials have been removed, is made into compost to be used in filling in swamplands, abandoned mining sites, and parklands.

GLASS SEPARATION AND SORTING

— The U.S. Bureau of Mines has developed an automatic system to separate the mineral matter in incinerator residue. The material is ground up fine to help separate metal from glass where the two have been partially fused. Magnetism and flotation methods are being tested to remove the metals. The flint glass is separated from colored glass and other contaminants by high-intensity magnetism. A plant capable of continuous operation and of separating 1,000 lbs of residue per hour is completed, and full-scale tests are being conducted.

— Another method of sorting glass fragments by color has been developed by the Sortex Company of Michigan. It's an optical method that can distinguish

flint (clear) glass from colored fragments — when using pieces 1/4" to 5/8" in diameter — up to one ton per hour.

— The operation of the device seems relatively simple, but it's not. Glass fragments are made to move single file on narrow high-speed belts and fall between photoelectric cells and a special background. Virtually all colored glass or other contaminants can be rejected by an air jet, and the rejects can be further sorted if necessary to achieve a relatively standard fraction of colored glass.

— The efficiency and precision of the color sorter is impressive.

ECONOMICS OF HANDLING WASTE GLASS

— Several types of garbage compactors for use in the home are now on the market in North America. There are also several types of glass crushers now available and these will make disposal of waste glass easier and the collection and recycling of glass containers more economical. Bottle crushers of the type described below are being used in hospitals, restaurants, bars and many other commercial, social and industrial institutions to reduce the volume of glass for easier and more economical handling.

The Robbins Thorn Bottle Crusher

— This crusher will reduce any bottle up to five inches in diameter to one tenth of its original size. The unit consists of three sections, the lowest containing a rotary crusher, and the upper two forming the loading spout. Bottles are fed in, neck first, from the top, pass through the crushing chamber and are discharged as cullet (crushed glass) into a bin below.

— The unit stands 58 inches high, weighs 80 lbs and takes up a floor area 20 x 20 inches. It can be fitted to the lid of an ordinary galvanised garbage can and can be operated on ordinary household current.

— The Robbins Thorn Bottle Crusher can crush

over 2,000 bottles per hour. The machine is distributed in Canada by Twindustries Ltd., 9545 Cote de Liesse Road, Dorval 760, Quebec.

RECYCLING GLASS CONTAINERS

— There are many ways of recycling waste glass containers, both actual and potential.

1. In the production of **new glass containers.** The industry has always used waste glass (called cullet) as part of the raw materials batch in the production of new glass containers. The percentage of waste glass in the batch varies from plant to plant, but the use of up to 50 per cent or more "cullet" in the batch is now considered a reasonable goal.
2. One of the most promising developments in the search for ways of using waste glass is in a product called **"glasphalt"** — a road paving material in which the aggregate is replaced by crushed waste glass.

— In 1970 the Glass Container Council of Canada paved two stretches of road with glasphalt, one at the Dominion Glass Company plant in Bramalea, Ont., and a second on Scarden Avenue in Scarborough, Ontario.

— These strips are being subjected to a variety of tests at present. 65 per cent of the paving batch was made of crushed waste non-refillable soft drink bottles. Skid resistance is reported "excellent". The road surface is tough, smooth and weather-resistant, and should be longer wearing than ordinary asphalt.

— Estimates indicate that the need for crushed glass aggregate for glasphalt would far exceed the supply of waste container glass presently available. Most municipalities have their own hot batch asphalt plants and would need only to remove the glass from their own refuse for such a use. The glass container industry is very optimistic that this will prove to be a development of major importance and economic value.

3. For several years now, U.S. Bureau of Mines

Technicians at the Tuscaloosa Metallurgy Research Laboratory, University of Alabama, have been developing new products from waste, both before and after incineration. One of the most promising developments in the use of waste glass is the success they have had in manufacturing **building bricks** from waste glass. Bricks have been made using 80 per cent clean waste glass, with 20 per cent clay binder. These bricks stand up to building code requirements in all areas of North America.

4. **A glass wool insulation** material has also been developed by the U.S. Bureau of Mines, using up to 65 per cent clean waste glass.
5. Other developments are **glass beads** for use in highway paints, and **fiberglass** insulating material.
6. **Aerated concrete,** making use of glass in the same manner as glasphalt, with the waste glass replacing other aggregate in the concrete, has been developed at Stanford University, under a grant from the U.S. Bureau of Mines.

"A preliminary economic feasibility study has been made, which indicates that aerated concrete using waste glass as an aggregate can compete successfully with conventional materials now used for walls, floors and roofs. The principal saving over conventional materials is in erection labour costs, which are low because aerated concrete can be used in large panels without the necessity of heavy equipment for placing. The cost of the raw material should be zero or negative."

The report by Professor C.W. Richards of the faculty of Civil Engineering Materials, Stanford University, concludes that: "the use of waste glass from urban refuse in the production of lightweight aerated concrete is not only technically and economically feasible, but would contribute to environmental control."

Waste glass is available in urban areas where natural sand is often difficult to obtain and the use

of waste glass in the manufacture of building materials would be a definite contribution to the waste disposal problem.

The conservation of raw materials demands salvage, and the long-range efficient management of waste calls for re-use. We are convinced that salvage will materially reduce pollution and all our research is predicated on this conviction.

Based on these developments, the glass container industry has concluded that there are more potential uses for waste container glass than there is glass available from refuse now or in the predictable future, and in addition, the waste glass is reusable without elaborate refinement.

BOTTLE REDEMPTION & RECYCLING PROGRAM

— On July 2, 1970, the Glass Container Council of Canada opened three bottle redemption and recycling depots in Ontario in a three-month test program designed to redeem as many non-refillable soft drink bottles as possible. Bottles were purchased from individuals and associations for ½¢ each or $15.00 per ton in bulk amounts.

— During the three-month test period many service clubs and other organizations, boy scout troops, anti-pollution groups and others, brought in nearly 300,000 non-refillable soft drink bottles.

— Encouraged by this success, the program was extended in October and new recycling centres were established in Moncton, New Brunswick; Montreal, Quebec; Bramalea, Ontario and Redcliff, Alberta. Nine such depots were in operation at the end of the year, and by March 1971 over one million bottles had been redeemed and recycled into new glass containers.

— Bottles accepted at the recycling centres must be reasonably clean and sorted by colour. Paper labels are no problem, but aluminum neck rings that are part of resealable bottle tops should be removed. That is because the containers will be melted in a furnace and formed into new containers, and the

metal would contaminate the new glass.
— Following is a list of bottle recycling depots in operation as of March 1971:

LOCATION OF BOTTLE RECYCLING DEPOTS

— Ahlstrom Canada Limited,
P.O. Box 1068,
Moncton, New Brunswick
Please Contact: S.M. Rigby
Telephone: (506) 532-4446

— Consumers Glass Company Limited,
85 Montcalm Street, N.,
Candiac, Quebec
Please Contact: F. McCheyne
Telephone: (514) 489-9361

— Dominion Glass Company Limited,
2376 Wellington Street,
Montreal, Quebec.
Please Contact: E. Blouin
Telephone: (514) 933-7331

— Consumers Glass Company Limited,
258 - 2nd Avenue,
Ville St-Pierre, Quebec.
Please Contact: F. McCheyne
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— Consumers Glass Company Limited,
249 Kipling Avenue,
Etobicoke, Ontario.
Please Contact: N. Kiernander
Telephone: (416) 239-7151

— Dominion Glass Company Limited,
100 West Drive,
Bramalea, Ontario.
Please Contact: S. Collins
Telephone: (416) 454-1230

— Dominion Glass Company Limited,
Chapple Street,
Hamilton, Ontario.
Please Contact: D. Shaw
Telephone: (416) 544-3741

— Dominion Glass Company Limited,
1250 James Street,
Wallaceburg, Ontario.
Please Contact: B. Massey
Telephone: (519) 627-2271

— Dominion Glass Company Limited,
1st Ave. & 1st St. N.E.,
Redcliff, Alberta.
Please Contact: W. Sellhorn
Telephone: (403) 548-3901

LITTER

— Litter is anything people discard in the wrong place.

— People have been littering since the dawn of history.

— The citizens of ancient Rome were warned that littering could lead to fines or corporal punishment.

— Shakespeare's father was fined for littering a street in Stratford, England.

— A Boston newspaper in 1874 condemned the actions of litterbugs at an Independence Day parade.

— Many studies have been made both in Canada and the United States to find out just what litter is. Such surveys, conducted by research organizations, high school and university students and members of anti-pollution organizations illustrate an amazing agreement in the proportion of various items found in litter:

COMPOSITION OF LITTER

	Canada	U.S.
Paper (Newspapers, containers, wrappers, cartons)	81.0%	59%
Cans (food, beer, soft drink & others)	6.4%	16%
Glass bottles and jars (food & beverage)	3.0%	6%
Plastics (containers and misc.)	1.1%	6%
Miscellaneous (rubber tires, auto parts, footwear, clothing, etc.)	8.5%	13%

— Almost everybody litters at one time or another but only people litter.
— People sometimes put the blame on the inanimate objects that become litter. But a used-up package just isn't up to it.

WHY DO PEOPLE LITTER?

— They are careless, thoughtless, inconsiderate and lazy.
— They have little sense of responsibility.
— They don't carry litterbags in their cars or boats.
— There are too few litter baskets along streets and highways, at beaches, campsites and picnic grounds.
— Laws against littering are not enforced.
— People are generally indifferent toward the culprits.

CAN LITTERING BE STOPPED?

Most litter fighters agree there are three basic ways to lessen littering:
— Public education to teach people that littering is harmful, costly and wrong. To teach people that littering is a socially unacceptable habit. Anti-littering educational programs have succeeded elsewhere — in Switzerland, for example, and at Expo '67, and there is no reason why they cannot be successful in every area of the country unless, of course, we are convinced that Canadians are not capable of shouldering individual responsibility for the quality of their environment — and this, most of us do not believe.
— Plenty of litter baskets in the right places — and a litterbag in every car and boat.
— Strict enforcement of laws against littering. A massive anti-littering campaign mounted in Metropolitan New York several years ago with the help of a number of advertising agencies, newspapers, radio and TV stations, increased the percentage of streets rated "clean" from 56 to 85 over a four-month period.
— The organizers of the campaign concluded that those still littering must form a hard core of irresponsible barbarians who could not be reformed

by amiable slogans like "Cast Your Ballot for a Cleaner New York." However, a poll taken at the end of the campaign revealed that a majority of New Yorkers were not aware that they could be fined $25 for littering. As a result, a **tough** campaign was organized, warning litterbugs that they would be hauled into court. At the same time, the New York Sanitation Department recruited a flying squad of uniformed men to patrol the streets on motor scooters in search of offenders. After four months, 39,400 summonses had been handed out, and the magistrates did their duty by imposing $25 fines in each case. This is one type of action geared to make people more conscious of their own responsibility for the quality of our environment.

— A few people think the way to stop littering is to outlaw the use of objects that become litter. However, if we were to outlaw or ban all the items that show up in litter the list would be a long one, and the economic effects of such action in loss of jobs alone would be incalculable.

— Following are details of several litter surveys, among dozens, taken in various parts of Canada.

LITTER SURVEYS

CANADIAN RESEARCH SERVICES — LITTER COUNT PROJECT
(One Mile) Bedford Highway, Halifax, N.S., October 31, 1968

	Items	Total	Percentage
PAPER:			
Packages (cigarettes, etc.)	1,033		
Newspapers (printed advertising)	1,792		
Tissues	353		
Wrappers	1564		
Others: Plain paper, cardboard, paper cups, paper matches, pieces of paper, cellophane, plastics, paper boxes, straws and cartons	1,630	6,372	92.57%
METAL CANS:			
Steel — tin	225		
Aluminum top	5		
Pull top	50		
Others: motor oil tin, aluminum plate, license plate	13	293	4.23%

GLASS:			
Bottles, refillable	49		
Bottles, non refillable	15 (.15%)		
Broken glass	7		
Broken bottles	4	75	1.08%
WOOD:			
Blocks, stirring sticks, piece of wood 2″ x 4″, plywood	6	6	.09%
OTHERS:			
Plastic, taillights, plastic bags, plastic insulation, pieces of metal, rags, rubber tubes, cloth, masonite, leatherette slipper, piece of arborite, leather glove, hub cap, scarf, fibre string, plastic cups, pieces of car battery, also flashlight, wire, plastic windows, plastic fork, plastic straws, plastic flower, plastic ice cream stick, asbestos, fibre cord, rubber tire, cloth toy, plastic bottle, piece of silverware, scrap metal, leather shoe, plastic toy, sponge, rope plastic belt, glove, plastic rain belt, plexiglas, sock	175	175	2.03%
GRAND TOTAL		6,921	100.00%

CANADIAN RESEARCH SERVICES — LITTER COUNT PROJECT

Richview to Rathburn on West side of Highway 27, Toronto.

Total No. of Bags: 20

	Items	Total	Percentage
PAPER:			
(a) Packages	272		
(b) Newspapers	57		
(c) Tissues	405		
(d) Other: bags, cups, boxes, sandpaper, pop cartons	291	1,025	78.5%
GLASS:			
(a) Refillable	15		
(b) Non-refillable	14		
(c) Other	—	29	2.2%

METAL CANS:			
(a) Steel — tin	67 (5.1%)		
(b) Aluminum	—		
(c) Pull Top	—		
(d) Other metal:			
Alm. moulding, Cable 31, tin foil, metal strips, gas filter, wire, rusty strips, caps	29 (2.3%)	96	7.4%
WOOD:			
bits, 21 stakes	53	53	4.0%
OTHER:			
felt, 1 shoe, 2 pcs cloth, jug, plastic cup, rubber tire, sponge, pail, rags, tubes, rubber pieces, bicycle tire, rubber cape Other total	103	103	7.9%
TOTAL		1,306	100.0%

CANADIAN RESEARCH SERVICES — LITTER COUNT PROJECT

One-mile section of Alberta Provincial Highway, No. 16

Total No. of bags: 22

	Items	Total	Percentage
PAPER:			
(a) Packages	797		
(b) Newspapers	13		
(c) Tissues	2,021		
(d) Other: Boxes, bags, rags, fiber board	30	2,861	81.5%
GLASS:			
(a) Refillable	112		
(b) Non-refillable	24 (1.0%)		
(c) Other	15	151	4.3%

METAL CANS:			
(a) Steel — Tin	95		
(b) Aluminum	5		
(c) Pull Top	—		
(d) Other: Metal pipe, clothes hanger, license plate, car jack	11	111	3.2%
WOOD:			
Sticks, blocks, clothes hangers	149	149	4.2%
OTHER:			
beer cartons, gloves, car reflector, rags, shoes, sponge, tire tube, rubber boots, auto tire, coat, etc.	237	237	6.8%
TOTAL		3,509	100.0%

CANADIAN RESEARCH SERVICES — LITTER COUNT PROJECT

One Mile Section of the Trans-Canada Highway in Winnipeg Area, May 20, 1969. (4 Tons)

	Items	Total	Percentage
PAPER:			
Packages (cigarettes, etc.)	1,095		
Newspapers (printed advertising)	179		
Tissues	244		
Wrappers	99		
Other (Miscellaneous cardboard, paper cups, lids and trays)	4,695	6,312	81.5%
METAL CANS:			
Steel — Tin (mostly 1 qt. oil cans; food)	38		
Aluminum top	329		
Pull Top	61		
Other: 2 & 5 gal. containers; 1 gal Anti-Freeze cans	67	495	6.4%

GLASS:			
Bottles — Refillable	44		
Bottles — Non-refillable	123 (1.23%)		
Other — (soft drink, etc.)	26	193	2.5%
WOOD:			
Boxes, planks, logs, broom and shovel handles	277	277	3.6%
OTHER:			
Tires, hubcaps, chrome, scrap metal, clothing, sacks, inner tubes, rope, vinyl, plastic signs, license plates, mufflers, gaskets	464	464	6.0%
GRAND TOTAL		7,741	100.0%

N.B. No litter surveys, to our knowledge, have been made in North America in which the various objects have been classified by weight as well as by item count. Since litter is usually picked up item by item, whether by mechanical means or by hand, it requires approximately the same amount of time and effort to pick up an object which weighs two ounces as it does to pick up one which weighs seven ounces. Weight is more significant, however, when the item to be picked up is a large piece of furniture, some auto parts, or other objects which, because of their weight and/or size, require special handling.

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Notes:

CANADIAN GLASS CONTAINER MANUFACTURING COMPANIES

and the location of their plants

— **Ahlstrom Canada Limited**
Moncton, N.B.

— **Consumers Glass Company Limited**
Toronto, Ontario
Candiac, Quebec
Ville St. Pierre, Quebec
Lavington, B.C.

— **Dominion Glass Company Limited**
Montreal, Quebec
Bramalea, Ontario
Hamilton, Ontario
Wallaceburg, Ontario
Redcliff, Alberta
Burnaby, British Columbia

GLASS CONTAINER COUNCIL OF CANADA
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